



Colpitt Oscillator using CMOS Technology based on Second Generation of Current Conveyers

Ghanendra Kumar¹, Dr. N.S. Beniwal²

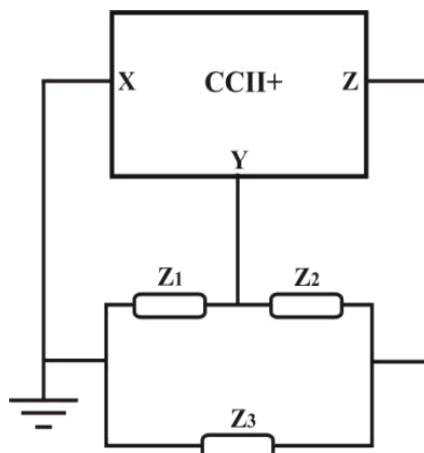
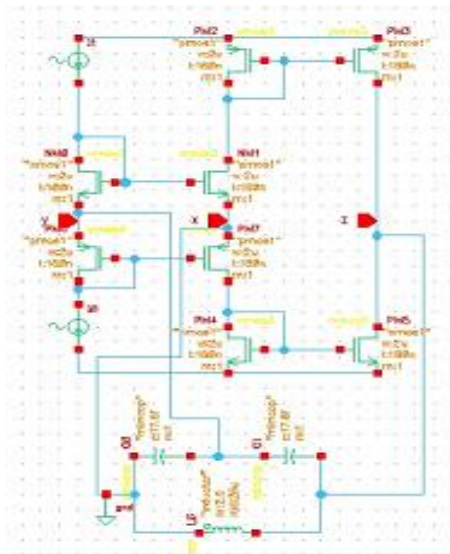
Dept of Electronics and Communication Engg, Bundelkhand Institute of Engineering & Technology, Jhansi^{1,2}

Abstract: CMOS Technology is used to high stability, high accuracy, and high output power, high amplitude. We use cadence virtuoso to design this type circuit, The proposed range of this oscillator is 2 Hz – 1000 Hz, there are many communications applications of this circuit. It is used to reduce power consumption as well as it reduces noise margin too. It also acts as an inverter as well as in switching applications.

Keywords: Colpitt Oscillator using CMOS technology based on second generation of current conveyers.

THEORY

This research article brings a Colpitts oscillator using CMOS technology based on second-generation current conveyor with minimum passive component.





The proposed Colpitts oscillator is designed to operate with a frequency range (2Hz-1000Hz), the introduction of the current conveyor for the application of various modern analog signal processing functions like oscillator , filter , astable multivibrator , square/triangular waveform generators , continuous time sigma delta modulators rectifier , etc.[1]

This research article brings a Colpitts oscillator using a single second-generation current conveyor , with minimum passive component. the fixed amplitude for different-different frequency Also a comparative study of the oscillator with different classification like frequency, error, amplitude and active and passive component [3]

The proposed Colpitts oscillator yields the following tuning law. Their frequency of oscillation can be calculated at the resonance of the tank circuit.

Frequency of oscillations (FO):- [2]

$$f = \frac{1}{2\pi} \sqrt{\frac{c1+c2}{LC1C2}}$$

Also, we know that to achieve sustained oscillations follows the loop gain should be unity as per the Barkhausen criteria.

$$A\beta=1$$

Where, A is the gain of the CCIIs and beta (β) is the feedback Factor. Using the Barkhausen criteria in the circuit diagram Z_1 and Z_2 is effectively in series. The voltage developed by Z_2 in the oscillator output voltage and the voltage developed across Z_1 is the feedback voltage.

Hence, to maintain the Barkhausen Criteria

$$\beta = \frac{Z_2}{Z_1} = \frac{C_1}{C_2}$$

$$A = \frac{C_1}{C_2}$$

SIMULATIONS & DISCUSSION

To verify the theoretical prediction of the frequency of oscillations of the oscillator circuit several cadence virtuoso simulations have been performed. . The frequency tuning of the oscillator is obtained from the change in the component value. Here circuits simulated values of the frequency of the oscillator quite agree well with the theory. A clear picture of the frequency of oscillations for different component values is illustrated with table-1 ranging from 2.250Hz to 1000Hz. The typical oscillator waveform to the frequency of oscillation of 2Hz-1000Hz with component value $C_1 = C_2 = 1\text{nF}$ and $L = 0.1\mu\text{H}$ is given. In reference there no discussion about power, but discuss about power, accuracy, and many parameter we discuss in this paper.

TABLE 1.

Variable component			Theoretical	Simulated	Error in %	power
C1	C2	L	value	value		
100 mF	100mF	100mH	2.250 Hz	2.245 Hz	0.222	8.72 μ f
100 mF	100mF	10mH	7.117 Hz	7.115 Hz	0.028	31.73 μ f
1mF	1mF	1mH	225.079 Hz	224.450 Hz	0.279	91.04 μ f
10 μ F	10 μ F	1mH	2.250 KHz	2.242 KHz	0.444	546.7 μ f
1 μ F	1 μ F	100 μ H	22.507 KHz	22.400 KHz	0.475	1.25mf
1 μ F	1 μ F	10 μ H	71.176 KHz	70.900 KHz	0.387	4.13mf
100n F	100n F	1 μ H	711.762 KHz	708.500 KHz	0.458	5.34mf
1nF	1nF	1 μ H	7.117 MHz	6.995 MHz	1.715	6.85mf
1nF	1nF	0.1 μ H	22.507 MHz	22.200 MHz	1.364	8.8415mf

Voltage output waveform of the oscillator with $C_1 = C_2 = 1\text{nF}$ and $L = 0.1\mu\text{H}$ frequency is 22.200MHz

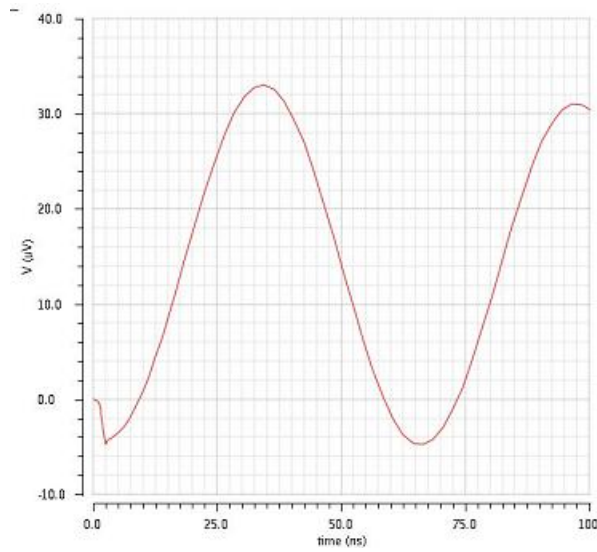


Figure 1: $f=2.245\text{Hz}$

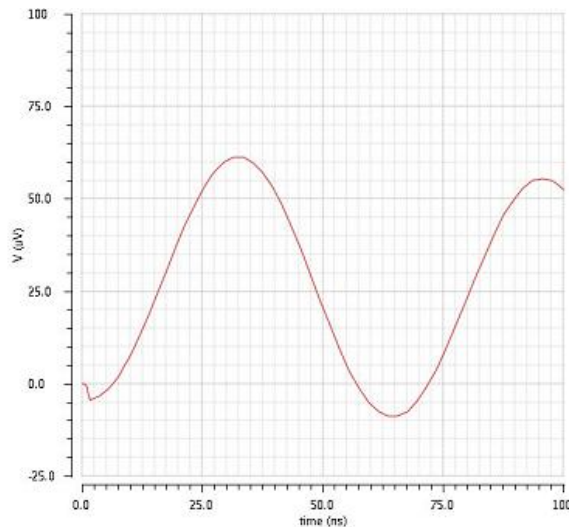


Figure 2: $f=7.500\text{Hz}$

Voltage output waveform of the oscillator with $C_1 = C_2 = 1\text{nF}$ and $L= 0.1\mu\text{H}$ frequency is $f=7.50\text{Hz}$

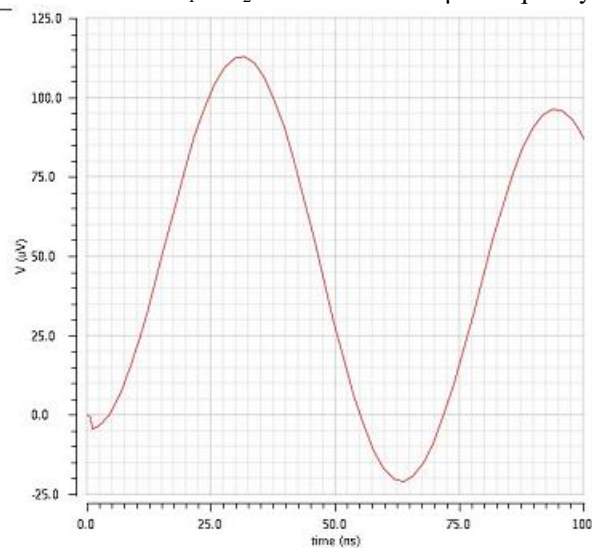


Figure 3: $f=100\text{Hz}$



Voltage output waveform of the oscillator with $C_1 = C_2 = 1\text{nF}$ and $L = 0.1\mu\text{H}$ frequency is $f=100\text{ Hz}$

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